What is claimed is:

1. A piezoelectric substrate made of an anisotropic piezoelectric crystal material and comprising a thin resonating portion, and a thick annular portion integrally surrounding the outer marginal edge of said resonating portion to form a concavity in at least one of major surfaces of said piezoelectric substrate, characterized in that:

the inner wall of said annular portion gently slopes in the one crystal orientation more than in the other crystal orientation perpendicular thereto; and

said piezoelectric substrate is longer in said one crystal orientation than in said other orientation.

2. A piezoelectric substrate made of an AT-cut crystal material and comprising a thin resonating portion, and a thick annular portion integrally surrounding the outer marginal edge of said resonating portion to form a concavity in at least one of major substrate surfaces of said piezoelectric substrate, characterized in that:

said piezoelectric substrate made of said AT-cut crystal material is longer in a z′-axis direction than in an x-axis direction.

3. A piezoelectric resonating element comprising excitation electrodes formed on both sides of said resonating portion in the piezoelectric substrate of claim 1 or 2 in opposed relation, lead electrodes extending from the excitation

electrodes to one marginal edge of the piezoelectric substrate lengthwise thereof, and connecting pads connected to the lead electrodes, respectively, characterized in that the lead electrode extending from the excitation electrode formed on the side of said concavity is routed along said gently sloping inner wall of the annular portion.

4. A piezoelectric resonator, characterized in that the piezoelectric substrate forming the piezoelectric resonating element of claim 3 is supported at one end lengthwise thereof in a cantilever fashion in a surface-mount package.

5. A surface-mount piezoelectric oscillator, characterized by the provision of at least the piezoelectric resonator of claim 4, and an oscillation circuit.

6. A piezoelectric substrate comprising a thin resonating portion, and a thick annular portion integrally surrounding the outer marginal edge of said resonating portion to form a concavity in at least one of major surfaces of said piezoelectric substrate, one side of said annular portion being extended to form a jut-out portion, characterized in that:

at least one concave notch open to both surfaces of the piezoelectric substrate is formed in a forward marginal edge of said jut-out portion.

7. The piezoelectric substrate of claim 6, characterized in that said concave notch is formed in one of both end corner

portions of the forward marginal edge of said jut-out portion.

8. A piezoelectric resonating element comprising excitation electrodes formed on both sides of said resonating portion in the piezoelectric substrate of claim 6 or 7 in opposed relation, lead electrodes extending from the excitation electrodes to the forward marginal edge of said jut-out potion, characterized in that either one of the lead electrodes is routed via said concave notch to the opposite substrate surface and connected to a connecting pad formed on said opposite substrate surface.

9. A piezoelectric resonator, characterized in that two connecting pads disposed side by said on the same surface of the jut-out portion of the piezoelectric substrate forming the piezoelectric resonating element of claim 8 are respectively bonded by a conductive adhesive to pads in a surface-mount package.

10. A surface-mount piezoelectric oscillator, characterized by the provision of at least the piezoelectric resonator of claim 9 and an oscillation circuit.

11. A construction of a piezoelectric substrate wafer having the piezoelectric substrates of claims 6 to 8 arranged in sheet form, characterized in that said concave notch is formed by making a through hole in the wafer astride adjacent piezoelectric substrates to simultaneously form such concave notches in the both piezoelectric substrate.

12. A piezoelectric substrate wafer having a plurality of piezoelectric substrates of claims 6 or 7 arranged in sheet form, characterized in that:

an unused region is disposed between said adjacent piezoelectric substrates; and

said concave notch is formed in one piezoelectric substrate by making a through hole astride the piezoelectric substrate and the unused region adjacent thereto.

13. A piezoelectric substrate comprising a thin resonating portion, and a thick annular portion integrally surrounding the outer marginal edge of said resonating portion to form a concavity in at least one of major surfaces of said piezoelectric substrate, characterized in that:

a resonating portion thickness fine-adjustment portion is formed on the substrate surface opposite to said concavity.

14. A piezoelectric resonating element, characterized by the provision of excitation electrodes formed on both sides of said resonating portion of the piezoelectric substrate of claim 13 in opposed relation, lead electrodes extending from the excitation electrodes to the forward marginal edge of the piezoelectric substrate lengthwise thereof, and connecting pads respectively connected to the lead electrodes.

15. A piezoelectric resonator, characterized in that the piezoelectric substrate forming the piezoelectric resonating

element of claim 14 is supported at one end in a cantilever fashion in a surface-mount package.

16. A surface-mount piezoelectric oscillator, characterized by at least the piezoelectric resonator of claim 15 and an oscillation circuit.

17. A piezoelectric substrate wafer, characterized in that a plurality of piezoelectric substrates of claim 13 are arrange in sheet form.

18. The piezoelectric substrate wafer of claim 17, characterized in that a dead space is interposed between adjacent piezoelectric substrates by two parallel dividing grooves.

19. A piezoelectric substrate wafer manufacturing method, characterized in that the resonating portion thickness fine-adjustment portion formed on the substrate surface on the opposite side from the concavity of each piezoelectric substrate of the piezoelectric substrate wafer of claim 17 or 18 is formed by filling an etchant into each aperture of a guide mask held against said opposite surface side of the piezoelectric substrate wafer on said opposite side surface thereof, said guide mask having arranged therein in a grid pattern a plurality of apertures each larger than the concavity.

20. A piezoelectric substrate made of an anisotropic piezoelectric crystal material and comprising a thin resonating

portion, and a thick annular portion integrally surrounding the outer marginal edge of said resonating portion to form concavities in both major surfaces of said piezoelectric substrate, characterized in that:

the inner wall of said annular portion defining each of said concavities gently slopes in the one crystal orientation more than in the other crystal orientation perpendicular thereto; and

the positions of those of marginal edges of the bottoms of said concavities lying in said one crystal orientation are aligned with each other.

21. The piezoelectric substrate of claim 20, characterized in that it is made of an AT-cut crystal material.

22. A piezoelectric resonating element, characterized by the provision of excitation electrodes formed on both sides of said resonating portion in the piezoelectric substrate of claim 20 or 21 in opposed relation, lead electrodes extending from the excitation electrodes to one marginal edge of the piezoelectric substrate lengthwise thereof, and connecting pads connected to the lead electrodes, respectively.

23. A piezoelectric resonator, characterized in that the piezoelectric substrate forming the piezoelectric resonating element of claim 22 is supported at one end lengthwise thereof in a cantilever fashion in a surface-mount package.

24. A surface-mount piezoelectric oscillator,

characterized by the provision of the piezoelectric resonator of claim 23, and an oscillation circuit.

25. A method for the manufacture of a piezoelectric substrate which is made of an anisotropic piezoelectric crystal material and comprises a thin resonating portion, and a thick annular portion integrally surrounding the outer marginal edge of said resonating portion to form concavities in both major surfaces of said piezoelectric substrate, and in which the inner wall of said annular portion defining each of said concavities gently slopes in the one crystal orientation more than in the other crystal orientation perpendicular thereto, said method comprising:

a mask forming step of covering the both major surfaces of a flat-shaped piezoelectric substrate with masks for forming therein said concavities; and

a concavity forming step of performing etching on the piezoelectric substrate covered with said masks to form concavities in the both major surfaces of the piezoelectric substrate exposed through apertures of the masks;

characterized in that: the positions of the masks are displaced relative to each other in said one crystal orientation to bring marginal edges of the bottoms of said concavities into alignment.

26. The piezoelectric substrate manufacturing method of claim 25, characterized in that said piezoelectric substrate is a piezoelectric substrate wafer having a plurality of

piezoelectric substrates arranged in sheet form.

27. A method for the manufacture of a piezoelectric resonating element having a thin resonating portion formed by making a concavity in one of major surfaces of a piezoelectric substrate, said method comprising:

a first main etching step of etching away predetermined portions of one of major surfaces of a piezoelectric wafer to form resonating portions;

a frequency measuring step of measuring resonance frequencies of said resonating portions;

a first fine-adjustment etching step of making fine adjustments to the thicknesses of said resonating portions based on the frequencies measured by said frequency measuring step;

a second main etching step of further reducing the thicknesses of said resonating portions; and

a second fine-adjustment etching step of making fine adjustments to the thicknesses of said resonating portions;

characterized in that either of said etching steps is a wet etching step.

28. The piezoelectric resonating element of claim 27, characterized in that said second main etching steps is a step of performing etching on said piezoelectric wafer over the entire area of the other major surface thereof.

29. The piezoelectric resonating element manufacturing method of claim 27, characterized in that said second main etching

step is a step of performing etching on said piezoelectric wafer over the entire area of either major surface thereof.

30. The piezoelectric resonating element manufacturing method of any one of claims 27 to 29, characterized in that said second fine-adjustment etching step is a step of performing etching on said piezoelectric wafer over the entire area of the other major surface thereof.

31. The piezoelectric resonating element manufacturing method of any one of claims 27 to 29, characterized in that said second main etching step is a step of performing etching on said piezoelectric wafer over the entire area of either major surface thereof.

32. The piezoelectric resonating element manufacturing method of any one of claims 27 to 31, characterized in that it further comprises a step of obtaining a plurality of piezoelectric resonating elements from one piezoelectric wafer by severing the wafer into individual piezoelectric resonating elements after forming a plurality of concavities in the wafer.

33. The piezoelectric resonating element manufacturing method of claim 31, characterized in that said frequency measuring step of claim 27 is a step of making a frequency measurement for all of the resonating portions, and that said firs fine-adjustment etching step is a step of performing etching for each of said resonating portions.

34. The piezoelectric resonating element manufacturing method of claim 32 or 33, characterized in that the frequency measuring step in claim 27 is a step of measuring frequencies of some of the plurality of resonating portions, and that said second main etching step and said second fine-adjustment etching step are steps of simultaneously performing etching all the resonating portions.